Citation:

Pittaway JK, Ahuja KD, Robertson IK, Ball MJ. Effects of a controlled diet supplemented with chickpeas on serum lipids, glucose tolerance, satiety and bowel function. *J Am Coll Nutr.* 2007 Aug;26(4):334-40.

PubMed ID: 17906185

Study Design:

Randomized Crossover Trial

Class:

A - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To compare the effects on serum lipids, glucose tolerance, satiety and bowel function of a diet supplemented with chickpeas to a wheat based diet of similar fiber content and also the impact of a lower fiber diet on bowel function and satiety.

Inclusion Criteria:

- Free living adults less than 70 years old
- Not taking medication for hyperglycemia or hyperlipidemia.

Exclusion Criteria:

None specified other than age and medication concerns consistent with inclusion criteria.

Description of Study Protocol:

Recruitment: methods not specified

Design: Randomized crossover trial

- Two dietary controlled interventions of five weeks each, with a washout period of 6-8 weeks between interventions.
- Additional study of low fiber diet for 3 weeks was also done to assess impact of fiber on bowel function and satiety only.

Blinding used: not specified

Intervention:

- Chickpea Diet was based on consuming 140 grams of canned, drained chickpeas daily plus bread and shortbread biscuits made from 30% chickpea flour.
- Wheat Diet was the control diet based on the daily consumption of whole wheat bread and high fiber

breakfast cereals.
- Low Fiber Wheat Diet included white bread and lower fiber breakfast cereals.

Statistical Analysis:

- STATA Statistical Data Analysis, version 8.2 (STATA 8.2 Statacorp, USA)
- Repeated measure ANOVA using General Linear Modelling
- Wicoxon's Signed Rank Test for non-parametric data

Data Collection Summary:

Timing of Measurements

- Prior to study start and during each study phase: dietary intake via 4 day weighed records
- After first and final week of each study period: questionnaire completed regarding bowel function and satiety.
- Fasting blood samples taken at unspecified times (assume start and end of chickpea and wheat study periods)
- Bowel transit time studied in 12 participants during the final week of each study period.

Dependent Variables

- Bowel transit time, hours
- Total cholesterol (TC), mmol/L
- LDL cholesterol (LDL-C), mmol/L
- HDL cholesterol (HDL-C), mmol/L
- Triacylglycerols, mmol/L
- Glucose, mmol/L
- Insulin, μU/mol
- Homeostasis model of insulin resistance (HOMA-IR)
- Body weight

Independent Variables

- Chickpea diet
- Wheat diet
- Lower-fiber wheat diet

Control Variables

- Participants refrained from eating any foods with cholesterol lowering claims or foods with high fiber claims and were instructed to maintain their normal physical activity throughout the study.
- Study diets were planned to be of similar energy, protein, carbohydrate, fat and fiber content to normal eating pattern for each individual and encouraged consistent consumption of type and quantity of fats.

Description of Actual Data Sample:

Initial N: 31, sex not specified

Attrition (final N): 27 (17 female, 10 male) participants in chickpea and wheat diets and 18 of these (11 female, 7 male) also completed the low fiber diet study. 12 participants (sex not specified) completed additional bowel transit time studies during each phase.

Age: 50.6 ± 10.5 years

Ethnicity: not specified

Other relevant demographics:

- BMI = 28.8 ± 4.4 m/kg^2
- Usual diet fat content = 87.66 ± 28.31 g/day (33% of energy)
- Usual diet fiber content = 27.9 ± 7.1 g/day

Anthropometrics

Location: Australia

Summary of Results:

Key Findings

- There was a significant reduction in mean serum total cholesterol of 0.25 mmol/L ($p<0.01$) and LDL cholesterol of 0.20 mmol/L ($p=0.02$) during the chickpea diet compared to the wheat.
- This change may have been due in part to an unanticipated shift in fatty acid composition (increased polyunsaturated fats).
- Results for glucose, insulin and insulin resistance were not significantly different.
- The mean bowel transit time was 10.6 hours longer during the chickpea diet compared to wheat ($p=0.02$) and 8.8 hours longer during the lower fiber diet compared to high fiber ($p=0.03$).
- Participants reported greater satiety on the chickpea diet

The table below is a comparison of results for each dietary intervention phase

	Wheat	Chickpea
Total Cholesterol (mmol/L)	6.13 (5.62-6.65)	5.88 (5.36-6.39)
Low Density Lipoprotein (mmol/L)	4.09 (3.65-4.52)	3.89 (3.45-4.33)
High Density Lipoprotein (mmol/L)	1.36 (1.21-1.50)	1.33 (1.19-1.47)
Triacylglycerol (mmol/L)	1.53 (1.31-1.75)	1.44 (1.14-1.75)
Glucose (mmol/L)	5.33 (5.04-5.62)	5.26 (5.02-51)
Insulin (µU/ml)	9.33 (6.89-11.77)	9.87 (7.38-12.35)
HOMA-IR	2.23 (1.54-2.92)	2.33 (1.68-3.00)

Other Findings

Body weight (kg) after each intervention period was comparable (not significantly different).

Author Conclusion:

The small but significant decrease in serum total cholesterol and LDL cholesterol during the chickpea diet compared to the equivalent fibre wheat diet was partly due to unintentional changes in macronutrient intake occurring because of chickpea ingestion. If dietary energy and macronutrients were not controlled, chickpea consumption might result in greater benefits via influence on these factors.

Reviewer Comments:

Sponsored by The Grains Research and Development Corporation.

Strength: diet modifications individualized to replicate normal intake as much as possible other than study components

Weakness: small sample size, subjective responses on participant questionnaires, and individual variability, recruitment methods not specified

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Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes
Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	???
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	No

3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	N/A
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	No
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	Yes
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	N/A

6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	Yes
6.6.	Were extra or unplanned treatments described?	Yes
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	No
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes

9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	???
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	???